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NOTES ON THE HABITS AND LIFE HISTORY OF CALLIGRAPHA PNIRSA STAL (COLEOPTERA).

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In the late afternoon of May 30, 1901, the writer captured, within the city limits of Rochester, Minnesota, the first specimen of this beautiful beetle ever seen by him. Two were seen in close proximity but one escaped by feigning death.

In 1904 the beetle thus collected was determined by the late Frederick Knab as *Calligrapha pnirsa*. Mr. Knab advised that a close watch be kept on basswood trees, Tilia americana L., in the vicinity of the place of capture. This suggestion was followed and in April, 1905, before the frost was fairly out of the ground in the woods, a careful search beneath several large groups of basswood trees, growing near where the first specimen was taken, resulted in unearthing several mature beetles. These were found a few inches below the surface, in the firm soil underlying the leaf mold, and had evidently hibernated in rude earthen pupal cells.

At intervals during the spring of 1905 adults were taken near this same spot as they were ascending basswood trunks just before dusk. Their usual activity appeared to begin shortly before sundown and continued indefinitely into the darkness of the night.

Hoping to gain some knowledge of the life history of this little known species, twenty adults were captured on May 30, 1906 and kept alive for observation. They were placed in a cage with freshly gathered basswood leaves on which they began to feed almost at once. The feeding of the adults of this species produces ragged notches in the edges of the leaves, while the larvae feed on the under surface, eating the epidermis and chlorophyll, thus producing irregular transparent "windows" scattered here and there over the leaf.

The next morning after the introduction of the adults, several egg masses were found, attached to the leaves in the cage. In all nearly one hundred eggs were found. They were of a peculiar velvety raspberry red, a soft beautiful color, and had a finely reticulated surface. They were placed on end in small clusters in the same fashion as those of the well-known *Leptinotarsa decemlineata*. But the eggs of this *Calligrapha* were much more nearly oval than those of *Leptinotarsa* and measured about 2 mm. in length by a little less than 1 mm. in diameter.

These eggs began to hatch in just seven days, the first larvae emerging June 6. The young, almost as soon as they were out of the egg, fed eagerly and continuously on the basswood leaves and grew rapidly. But lack of proper care brought disaster to this first attempt and the larvae all died.

On June 13 another supply of beetles was obtained and a fresh lot of eggs was speedily deposited. These eggs were taken charge of by Miss Kate Ainslie, a niece of the writer, and she is herewith given credit for such records as were secured.

On June 20 larvae were once more in evidence. These were confined in glass covered plant crocks partly filled with moist earth and were supplied daily with fresh basswood leaves. The larvae readily accepted the situation and throve in confinement.

On June 27 they molted for the first time. The second molt was observed July 4, the third on July 9 and on July 24 a part at least of the larvae molted again, this time a retarded and possibly abnormal molt. After each molt the larvae remained a vivid salmon pink for a number of hours before fading to their normal dull reddish color.

On July 29 most of the larvae descended beneath the surface of the earth in the cage but for some unknown reason these reappeared on the surface August 2, only to make a final descent next day. On August 16 some of the pupae were exhumed from the earthen cells they had fashioned and appeared about ready for emergence, since some of them showed motion when disturbed.

In captivity the males are exceedingly pugnacious and amorous, displaying great activity in their contests to obtain possession of the females. No pitched battles were observed, but all sorts of manoeuvres were resorted to in driving away rivals. In some cases these contests resulted in one or the other having his antennae or tarsi bitten off by his opponent. These traits may have been partly the result of confinement, with its unusual close proximity of individuals, but this could hardly account for what seemed a common characteristic of the males.

The nocturnal habits of this species, noted above, should be borne in mind when one considers the infrequency of observation of this conspicuous species and its rarity in collections. So far as I know it has never been taken except at dusk and only then because of a knowledge of its habits. It may be much more widely distributed than existing records would indicate.

In view of the fact that twenty years have now elapsed since my first note of capture was published (Can. Ent. Vol. 37, p. 392), and that no additional information on distribution or habits has appeared meanwhile, I may be justified in recording the rearing observations detailed above, and also in including further notes on the species.

The following comments on the identification and names of this species have been received from Mr. H. S. Barber of the National Museum.

"I can not follow Weise, 1916 (Junk's Coleop. Cat., pars 68, p. 38) in adopting the generic name *Polyspila*, Hope, 1840, to supersede *Calligrapha*, Erichson, 1847, but believe the latter name was established in 1833 by Chevrolet in the Dejean Catalogue (page 398) and that Erichson, 1847, merely described a new species of the genus from Peru.

"The genotypes are as follows:—

Calligrapha, Chev. 1833: type Chrysomela polyspila, Germ. 1812, designated by Motschulsky, 1860 (Schrenk's Reisen Amurl. p. 198).

Polyspila, Hope, 1840, and *Boliographa* Mots., 1860 are isogenotypic by original designation, the type being *Chrysomela philadelphica*, Fab., whose use of the earlier Linnean specific name appears unquestioned.

"The specific name *pnirsa* was given by Stal, 1860 (Ofv. Vet. Acad. Forh. Vol. 17, p. 462) to a unique specimen said to be from Costa Rica and this type has been figured by Jacoby, 1882 (Biol, Centr-Amer. Coleopt VI, Pt. 1, p. 201, pl XI, fig. 18), to whom the species appeared to be an extreme form of *C. anchoralis*. This figure of Stal's holotype agrees so exactly with certain Canadian and Minnesotan specimens that I have little doubt that the Costa Rican record is an error and that the application of this name by Horn, 1884 (Can. Ent. Vol. 16, p. 128), accepted by Linell, 1896 (Journ. N. Y. Ent. Soc. Vol. 4, p. 199), is correct for this species. Its striking and unique appearance is due to enlargement and confluence of the small black elytral areas of our more familiar species, so that one sees only regularly placed white spots upon a black field."

The Canadian National Collection at Ottawa contains about twenty specimens of this rare beetle and through the courtesy of Dr. J. McDunnough I am able to close this paper with the locality records he has kindly furnished me, including in this list data from the collection of the late F. Knab of Washington, and, for the sake of completeness, my own locality record. The few recorded dates are all in June except those for four specimens from Montreal Island, collected Sept. 16, 1902.

QUEBEC: Montreal Island; Hull; Levis Co.; Chambly Co.; Rouville Co.
ONTARIO: Ottawa; Hamilton, and Western Ontario.
UNITED STATES: Rochester, Olmsted Co., Minnesota.

OBSERVATIONS ON THE ECOLOGY OF THE MAYFLY, *BLASTURUS CUPIDUS*.

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This mayfly, first described by Thomas Say in 1823, under the name of *Ephemera cupida*, with evident confusion of the sexes, was subsequently described by Francis Walker, Herman Hagen, Benjamin Walsh and Rev. A. E. Eaton. Walker added three synonyms and Hagen one more, though the latter corrected Say's error concerning the sexes. Walsh, writing from Rock Island, Illinois, in 1862, says that he found the subimago occurring rather abundantly "on rafts of Wisconsin pine-logs from the middle of May to the middle of June, unaccompanied," so far as he could discover, "by the imago." From these subimagoes he successfully reared one male imago. Rev. A. E. Eaton described and figured the legs and wings of the adult, and the nymph of an undetermined species of Blasturus, with its gills and mouthparts.

The nymph was first reared by Edward Berry in 1903. He figured the gills and tails. Prof. James G. Needham included this species in an account of the mayflies of New York State, with a new description of the nymph, which he had reared in 1897 from Six Mile Creek at Ithaca. Dr. Anna H. Morgan, (1911 and 1913) has given the most comprehensive account of this species. She figured the nymph, the male subimago, the imago, and the egg. The present paper is intended to supplement her work, and go more into detail as regards certain phases of the mayfly's life and activities.

LOCAL HAUNTS OF THE NYMPH.

Many of the streams in the vicinity of Cornell University, Ithaca, New York, are favorable for the development of this interesting little mayfly, but most of the studies were made from Cascadilla Creek, in that portion of its course which is most convenient of access from the Campus. This creek is for a large part of its course rapid-flowing, over muddy or gravelly bottom, or over beds of shale. A careful study of this stream, its physical features, velocity and strength of current as well as chemical analyses of its waters, has been made by W. A. Clemens (1917), in connections with his study of the swift-water mayfly *Chirotonetes*. He has shown that the amount of pollution is not excessive, and that the oxygen content is high throughout the year. A low carbon dioxide content throughout the year is also shown, this being most noticeable in mid-summer. These results hold good both for the swift-water, haunts of *Chirotonetes*, and the quieter backwaters more favorable for the development of *Blasturus cupidus*.

A favorite haunt of the Blasturus nymphs during the autumn months was a portion of Dwyer's Pond that lies beneath a spreading hemlock in an area of relatively quiet water, which had however, at all times a distinct though sluggish current flowing through it. A jutting shelf of rock cuts off the main stream, and in the shelter thus formed a swampy growth of burreeds extends down into the pool beneath the hemlock. A bed of brownish mud and ooze is thickly overgrown with Elodea and fringed with the burreeds, and here the nymphs are very abundant. The water here, though shallow, did not freeze over until the weather became quite cold, there being small springs flowing into it. Shelter also was afforded by the big tree. At any rate, Blasturus could often be taken here without trouble, when the adjacent swift water was covered with an inch or more of ice.

During a January thaw, Blasturus nymphs were collected from grasses and roots close along the shore of the swifter portions of the stream some distance above Dwyer's Pond, where the depth of the creek was from 6 to 15 inches. Clinging here near the banks, they were not washed away nor frozen into the ice, and seemed to thrive as well as in the quiet backwaters. Nymphs taken from this environment were placed in quiet water in the Laboratory, and with a few exceptions were reared to subimagoes and adults.

Later in the spring many nymphs were taken from a small pool near the main stream of Cascadilla, which seemed to have, however, no connection with the main stream. The nymphs must have spent their entire life cycle in this absolutely quiet water.

THE NYMPH

The nymphs of Blasturus are graceful, brownish, insects, somewhat flattened in shape of body, with large, conspicuous, plate-like gills. The upper part of the body and the legs are marked and blotched with a darker color, this being most noticeable in a nymph that has just molted. The gills are often most beautiful, seeming to have the texture of delicate silk. They give the nymph a flounced effect. They are rather easily broken off, and it is not unusual to see a nymph, especially in the stage just preceding its emergence, with but one or two pairs of gills remaining. Sometimes all those on one side are lost. In the earlier periods of its career, such lost gills are without doubt regenerated, as small nymphs minus a pair of gills when collected, cannot be distinguished from the others in

two or three weeks time.

The legs are fitted for walking or climbing, and the nymphs are quite agile in such movements. The tails are moved up and down at frequent intervals, both when feeding and when at rest. These are long and are fringed with many short bristles. They seem to be useful in aiding the nymph to balance itself when swimming. Nymphs which had in some way lost all but the mere stubs of the tails often seemed much averse to swimming, or if they did make the attempt, moved only for short distances, sometimes falling on their backs and only righting themselves with difficulty. Their method of swimming then was very jerky, much different from the ordinary movement of the nymphs through the water.

Blasturus nymphs seem to depend for protection more upon coloration than upon swiftness of movement. When resting quietly upon a spray of Elodea or a bit of burreed stem, they are almost invisible, even in the laboratory under unnatural conditions. The movements of the nymphs are slow as compared with those of many other mayflies. They can move both forward and backward with equal facility, and will often sidestep quickly if disturbed from above. Although rather slow, they often move quite a distance without stopping. Six nymphs were selected for an experiment to show the actual distances travelled at one time. The average distance travelled by these nymphs in one effort was 137.0 mm., or more than 10 times the length of the largest nymph.

In swimming, the nymphs progress rather slowly through the water by means of a series of wave-like undulations of the body. The abdomen, tails and gills serve as organs of propulsion, while the fore part of the body moves up and down alternately with the movements of the abdomen. The legs are held more or less stiffly while swimming, and the abdomen does most of the work of pushing the body forward.

Nymphs of Blasturus will often feign death when disturbed especially if removed from the water. They remain very quiet, whether on rubbish or lying unprotected by their natural back-ground. After a time, however, they quickly recover themselves and run about briskly. The length of time during which a nymph will thus feign lifelessness varies with conditions and with individuals. One nymph remained thus for 13 seconds when first disturbed, but only for 8 seconds when disturbed immediately afterwards. Many remain in this attitude for a much longer time. Nymphs which had been kept for some time in the laboratory and handled almost daily, seemed to feign death only for a very brief time.

The nymphs seem very social, being usually found together in some numbers. When observed in the laboratory, they live together very peaceably. Two or three will often stand facing each other quietly for several minutes, occasionally greeting one another by touching their antennae together, tip to tip. When several are feeding on the same burreed stem, one will often lash out sidewise with its tails, as though to frighten away the other nymphs. If two come along the stem directly toward each other, some such performance as this may take place: one endeavors with quick movements of the head and jaws to intimidate the other. This proving ineffective, it approaches nearer, rears its forelegs and the fore part of its body toward the other, threateningly. This threatening attitude is often assumed by the two nymphs alternately. After a few seconds of this peculiar demonstration, in which neither yields ground to the other, both nymphs fall to

feeding again, near each other, quite amicably. If, however, one nymph has the superior position on top of the burreed, another, approaching from below seems to find the vantage point of his opponent too strong a factor against him, and soon moves away, after a little display of rearing on the part of the favored one.

The mouthparts of Blasturus nymphs are rather generalized. Brushes of hairs upon nearly all of the mouthparts are probably useful as diatom rakes, particularly those of the maxilla, many of which are barbed and bent slightly toward the front. In the case of one medium-sized nymph which was observed feeding upon a spray of cladophora, the action of the maxillary and labial palpi could be plainly observed sweeping the food toward the mouth. The action here seemed to be mainly one of scraping diatoms from burreed stems or from sprays of Cladophora. Some sprays of the latter, examined under the microscope, were seen to be well coated with the diatom, *Cocconeis*. These were given the nymphs, which fell to stripping them eagerly. The same sprays were later re-examined and it was found that the nymphs had done the stripping work with considerable thoroughness. Burreed stems seemed on the whole acceptable, and were also easy of access, so these were used to furnish the bulk of the food for the nymphs in captivity. The smaller nymphs confined themselves mainly to stripping these stems of their thick coating of diatoms, while the larger ones fed also upon the actual tissues of the burreed, skeletonizing them in a short time.

In the winter and spring of 1919, nymphs captured at various times and in various places were examined for their stomach contents, and the results of 57 such examinations are here tabulated.

RECORD OF EXAMINATIONS OF STOMACH CONTENTS OF BLASTURUS NYMPHS.

Dates when taken	Ja. 17	Ja. 25	Fe. 7	Mc. 4	Ap. 7	Ap. 24	My. 1	My. 3	My. 5	Total
Number examined	8	5	8	2	5	9	10	5	5	57
Diatoma	6	4	8	1	5	1	2	1		28
Navicula	7	5	8	2	3	8	10	5	3	51
Synedra	3	3	8	1	2	5	3	2	2	27
Meridion	3	1	8	2	2	5	1	4	2	28
Cymbella	4	3	8	2	4	7	5	4	1	38
Cocconeis	1				4		2			7
Stauroneis	1	2				2			1	6
Gomphonema	2				1	1	5	1		10
Other diatoms					1	1	8	3	2	15
Cosmarium							1			1
Zygnema							5			5
Cladophora	1		2	1	3	1	7	2	1	18
Ulothrix	5	3	4		3	3	10		1	29
Tribonema							3			3
Unidentified Algae	4	2	1				11	2	1	21
Seed-plant tissues	7	5	8	2		3	7	5	4	41

It will be noted that the food varies with the season, and that those diatoms which are common throughout the year appear most frequently in the diet. Tissue from higher plants is found quite commonly, as likewise are algae of various kinds. While the nymphs may have certain preferences in the matter of food, in the main they accept whatever soft vegetable substances a given season

and a given locality present.

That the nymphs may likewise take animal food, is evident from this observation. A small nymph was one day seen clambering about on the back of a large one, and removing diatoms from him. A vorticella had lodged on the thorax of the large nymph, and this little creature was, after three unsuccessful attempts, captured and eaten.

The process of moulting is in some respects akin to the final transformation from aquatic to aerial life, in respect to the actions of the nymph at both these periods. A nymph will lie flat on the bottom of an aquarium, move its abdomen in an undulating fashion, beginning at the tip and working forward, till presently the form of the nymph is seen within the outer skin. This skin splits and the nymph is free. It may take two minutes to accomplish the moult, and a few seconds more before the nymph begins its usual activities. The nymph is usually quiescent also for a short time preceding the moult. In early spring the nymphs grow very rapidly, the difference in size after each moult being very apparent.

The period just preceding transformation is full of danger for all mayfly nymphs. As they migrate toward the shallow waters near the shore many predaceous creatures follow them, and the nymphs fall easy victims to these marauders. Examinations of black-nosed dace (*Rhinichthys atronasus*) prove that a large percent of the food of these fishes consists of mayflies, and *Blasturus cupidus* was more than once found to be present. The stonefly *Perlinella drymo* was seen several times in the act of killing and devouring a Blasturus nymph, and a considerable number of these stoneflies were found in the shallow pool. None of the various sorts of predaceous beetles were ever seen to attack a nymph.

THE SUBIMAGO

As the time for this transformation draws near, a change in the actions and appearance of the nymphs may be observed. Males soon show reddish eyes, which upon examination are seen to be dividing into the upper and lower eyes of the adult insect. The wing pads of both sexes are gradually elongated, and very shortly before the transformation, a crumpling of the wings within the pads can be seen. Nymphs which have been living at some distance from the shore now begin to come in toward the shallow water, often entering temporary pools, which may dry up before they are fully developed. In these pools the nymphs swim about restlessly, especially during the warmer hours of the day, for several days before they are ready to transform. Here also come many enemies, and the death toll among the nymphs in such a shallow pool may be very great.

The time of this migration seems to vary considerably with local conditions. The spring of 1918 was quite warm and well advanced by the first of May, and nymphs were observed emerging on May 2. In somewhat more than a week the height of the transformation seemed to have been reached. In the late season of 1919, however, the height of transformation seemed to be about May 20th.

Nymphs which had been collected during a thaw in January and February, grew rapidly in the aquaria at the laboratory, and transformed a few at a time during the latter part of February and during March. The first one emerged on February 17. These adults would not mate in captivity and usually

lived less than 24 hours after the final moult. They were smaller than those taken later in the spring, which had lived wholly under natural conditions.

A female nymph which emerged on February 17 was observed carefully during her transformation. The nymph seemed to be acting strangely. First lying on its back, then swimming to a burreed stem and clutching it with its feet. Soon convulsive movements of the abdomen and tails occurred, beginning near the tip and working forward segment by segment. Next the thoracic region jerked, seeming to rise and fall. Whitish threads appeared along the upper center of the thorax, then a split over the meso– and metathorax, through which the head and prothorax of the subimago were thrust, shortly followed by the wings. The subimago rested a few seconds, then vibrated its wings and stepped clear of the nymphal skin. A large drop of liquid substance was expelled from the abdomen. The whole procedure required 6 minutes.

Several records were kept of the length of time required for the nymphs to effect this transformation, one nymph which was quiescent for 105 minutes had also a long period of activity immediately preceding transformation, for it swam about for 18 minutes, and required but 2 minutes for emergence, a total of 125 minutes. A second nymph required 116 minutes, a third but 42 minutes. The length of time required seems to vary considerably with different nymphs.

The subimago, as it steps free from the nymphal skin, is a dull brownish gray in color, but approximately the same size as the adult insect. The eyes of the male are large, taking up most of the space on the head, while the female's eyes are small in comparison. The tails are not as long as in the adult, but the middle one is proportionately longer. Neither the body nor the wings show any particularly striking markings. The mouthparts are useless, as in the adult—an amazing change from the efficient jaws of the nymph. This is the time for resting quietly and for the maturing of the sex organs.

The subimago remains for a short time resting upon the nymphal skin or upon some nearby support, and is then ready to fly. The length of time which may elapse between its transformation and its first flight varies with the atmospheric conditions. On a bright sunshiny day the creature may rise from the water after a few seconds of rest, and fly directly upward toward some tree on the bank. If the day be cloudy, however, it often rests for several minutes on or near the surface of the water, then makes a short flight to grasses or weeds overhanging the bank.

Birds are ever ready to snatch a subimago as it flies by. At the surface of the water are other foes, ready to pounce upon it at its most helpless moments; water-striders and other predaceous Hemiptera.

The length of the subimago stage was timed in a number of cases with the following results:

Time	18	19	20	21	22	23	24	25	26 hrs.
Number females	2	1	0	3	5	8	4	0	1
Number males	1	0	2	0	5	9	8	2	0

The average number of hours for the females was 22.4, for the males somewhat higher, 23.01 hours. The average time, for both males and females for the fifty specimens here recorded, was *22 hours* and *42 minutes*.

THE FINAL MOULTING.

The subimago remains more or less quiet for nearly 24 hours, as just shown, and is then ready for the last moult. This moult again resembles in many respects the normal moulting of a growing nymph and the transformation of the nymph to the subimago. In this case, however, the wings must also be pulled out from the tissue enclosing them, and any slightest injury to these delicate organs before the time for this last change usually causes disaster.

A subimago would take a firm grip on some convenient object, wave its wings up and down a few times, then gradually lower them till they were at right angles to the body and their tips were as low as the body. The characteristic wave-like contortions of the abdomen were observed at this moult also, beginning as always at the caudal and working forward. The wings were moved backward little by little, gradually decreasing the angle between the wings and the body, till they were held flat against the abdomen. The thorax then split along the median dorsal line, the head and thorax of the adult at once pushed through the opening, followed immediately by the upper portion of the wings and the abdomen and the legs. The legs were held seemingly rigid for several seconds after the adult had emerged. Then the adult grasped the support with its feet, and pulled out the tails and the tip of the abdomen from the subimaginal skin. The whole proceeding occupied 6 or 7 minutes. The adult is at once very active and immediately flies away.

THE IMAGO.

The wings of the imago are burnished and scintillate in the sunlight. In the distal costal space of the fore wings of the male is a spot, which seems to have no counterpart in the wing of the female. The two outer tails, particularly of the male, are longer than in the subimago, the middle one appearing quite short by contrast. The fore legs are usually held straight out before the body, as though serving to counterbalance the very long tails. Whether at rest or in flight they are always held stiffly ahead of the body. The flight of the adult is somewhat more rapid than that of the subimago.

While many flights or swarms containing only males were observed, no real mating flights were seen during the course of these observations, though many afternoons on apparently favorable days were spent in the field. The "stag" flights usually began about 3 p.m. and lasted intermittently till nearly 7 p.m. At no time were more than a dozen insects seen flying at once, and none of these swarms were directly over the water. One favorite location for this dance was a small grassy plateau about six feet from the water's edge, upon which the last lingering rays of sunlight fell. Here, in the sun's departing beams, the dance went on and on. Often the insects were rising not more than 7 or 8 feet and then with the undulating downward sweep, coming within a few inches of the grass The wings glistened brightly in the light and were a better guide to the location of the imago than the tails, which could barely be seen a few feet away. The downward movement is apparently a mere falling with the force of gravity, the tails and fore legs serving to increase resistance. Then the insect slowly but surely rises again, to repeat the performance. There is a rhythmic swing to the dance, though each dancer keeps his own time.

None of the imagoes kept in captivity, at ordinary room temperature,

lived more than 24 hours, and some less than that time. None of these had mated. Miss Morgan (1911) estimates that the number of eggs laid by one female is thirty-seven hundred.

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FOUR NEW PHLOEOTHRIPIDAE FROM THE UNITED STATES (THYSANOPTERA).

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The types of the new species described below are in the author's collection.

Rhynchothrips debilis sp. nov.

Male (macropterous). Length about 1.3 mm. Color light brown, with orange red subhypodermal pigmentation; antennae pale yellow, gradually shading to light brown in segments 7 and 8; legs light brown, with tarsi, distal ends of tibiae, and inner surface of femora (except at extreme base), pale yellow; fore wing heavily clouded with brown, much darker basally; hind wings brownish at extreme base, clear beyond.

Head broad, nearly 1.25 times as wide as long, broadest behind eyes; cheeks rounded, distinctly converging posteriorly, the head at base 0.85 the greatest width; lateral and dorsal surfaces striate with widely spaced anastomosing lines, which become reticulate on vertex, and with the usual minute, transparent bristles; vertex broadly rounded in front, overhanging insertion of antennae and bearing the anterior ocellus at its extremity; postocular bristles nearly as long as eyes, almost pointed, dark in color; a pair of strong bristles on the same line with, and dividing into thirds the space between, postoculars. Eyes about one-third as long as head, nearly as wide as their interval. Ocelli situated well forward. Antennae nearly 2.8 times as long as head; segments 3-8 long and slender, 4 much longer than 5 and about 2.4 times as long as wide; 3-5 subclavate, pedicels not sharply separated from rest of segment; 6 and 7 distinctly pedicellate, the latter broadly united to 8, which is slender and nearly three times as long as wide. Mouth cone long and pointed, reaching middle of mesosternum.

Prothorax along median dorsal line only 0.57 as long as head and (inclusive

of coxae) 3.3 times as wide as long, without a median dark line, surface without sculpture; all bristles present, blunt but not knobbed, dark in color, outer pair at posterior angles somewhat longer than postoculars, inner pair slightly shorter, midlaterals still shorter, the two pairs on anterior margin decidedly shorter and slenderer than midlaterals. Pterothorax slightly wider than prothorax, sides slightly convex, nearly parallel. Wings of fore pair with the three subbasal bristles blunt, dark brown, subequal in length, basal one somewhat slenderer. Legs long and particularly slender; fore tarsi unarmed.

Abdomen broader than pterothorax. Tube more than 0.9 as long as head, 2.2 times as long as basal width, which is twice the apical. Bristles nearly pointed, brown; lower lateral pair on segment 9 slightly longer than tube, much longer than terminal bristles.

Measurements of holotype (♂): Length 1.25 mm.; head, length 0.147 mm., width behind eyes 0.182 mm., at base 0.155 mm.; prothorax, length 0.084 mm., width (inclusive of coxae) 0.275 mm.; pterothorax, width 0.300 mm.; abdomen, width 0.315 mm.; tube, length 0.138 mm., width at base 0.063 mm., at apex 0.031 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	30	47	64	68	60	59	51	32
Width (μ)	28	28	26	28	27	26	23	12

Total length of antenna 0.41 mm.

Described from one male, taken at Whitesbog, New Jersey, July 6, 1915, by H. K. Plank, by sweeping cranberry (No. 276).

This species has the slenderest legs, the longest antennae, the shortest prothorax and the broadest head to be found in its genus.

Eurythrips macrops sp. nov.

Female (macropterous).—Length 1.5 mm. Color light brown, thorax and tip of abdomen slightly darker, with orange-red subhypodermal pigmentation which appears bright crimson-red by transmitted light; legs yellow, with femora and tibiae darkened with brown; antennae dark brown, gradually darker toward tip, segments 1 and 2 slightly paler, 3 with pedicel pale yellow.

Head slightly longer than wide, very slightly constricted at posterior angles of eyes; cheeks nearly straight and parallel, noticeably roughened throughout their length by anastomosing lines which do not extend onto dorsum of head; vertex slightly elevated and produced, nearly overhanging, bearing the anterior ocellus at its extremity; postocular bristles about half as long as head, expanded and obliquely truncate at tip, nearly colorless; *postocellar* bristles minute; occiput with a pair of small bristles midway between eyes and base of head, dividing the width of head into thirds. Eyes about one-third as long as head, not strongly bulging, though rounded and protruding, three-fourths as wide as long and three-fourths as wide as their interval, finely facetted, about 7 facets making up their lateral outline. Ocelli not situated far forward, the posterior margin of posterior ocelli opposite center of eyes; anterior ocellus directed forward. Antennae nearly 2.5 times as long as head; segments 3-7 pedicellate; 8 lanceolate, decidedly narrowed and subpedicellate at base and thus not at all broadly united to 7. Mouth cone particularly short, semicircularly rounded at apex, not attaining middle of prosternum; tip of labrum not attaining that of labium.

Prothorax relatively short and broad, 0.8 as long as head and (inclusive of coxae) 2.2 times as wide as long, surface without sculpture; anterior marginal bristles exceedingly minute, all others long, slender, dilated and obliquely truncate at apex, nearly colorless, midlaterals and the two pairs at the posterior angles about equal to postoculars, those at anterior angles only slightly shorter. Pterothorax distinctly wider than prothorax, narrowed posteriorly, sides slightly convex. Wings of nearly the same width throughout, quite uniform brownish but darker basally, with a faint, dark, median plica beyond base; no accessory hairs on posterior margin near tip; the three subbasal bristles dilated at apex, nearly colorless, basal one about equal to that on fore coxa, others slightly longer. Legs rather short and strong; fore tarsi with a minute, slightly curved tooth.

Abdomen slightly wider than pterothorax. Tube equal in length to head, and somewhat more than twice as long as basal width, which is distinctly more than twice the apical; sides concave. Bristles long and pale, those on segments 2-8 expanded and obliquely truncate at apex, those on 9 all pointed and nearly as long as the tube; terminal bristles also pale, slightly more than half as long as tube.

Measurements of holotype (♀): Length 1.46 mm.; head, length 0.173 mm., greatest width 0.162 mm., width behind eyes 0.153 mm.; eyes, length 0.059 mm., width 0.046 mm., interval 0.061 mm.; postocular bristles, length 0.085 mm.; pronotum, length 0.140 mm., width (inclusive of coxae) 0.308 mm.; pterothorax, width 0.345 mm.; abdomen, width 0.377 mm.; tube, length 0.174 mm., width at base 0.082 mm., at apex 0.035 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	45	52	65	62	63	55	46	45
Width (μ)	39	33	32	33	32	28	27	18

Total length of antenna 0.43 mm.

Described from one female taken by C. B. Williams at Orlando, Florida, November 4, 1914, on "grass by small lake" (C. B. W. No. 515).

The expanded bristles and long tube separate it from all its congeners except *osborni*, which has the head and basal antennal segments yellow, instead of brown, and the cheeks strongly diverging posteriorly, instead of parallel. *Osborni* has much smaller eyes.

Eurythrips tarsalis sp. nov.

Female (macropterous).—Length about 1.7 mm. Color nearly uniform dark blackish brown, with scattered, yellow, subhypodermal pigmentation which appears black by transmitted light; all tarsi, most of fore tibiae, and distal ends of mid and hind tibiae, bright, pale yellow; antennal segments 1 and 2 slightly paler than remainder of antenna, which is dark blackish brown, except pedicel of segment 3, which is abruptly yellow.

Head about 1.36 times as long as greatest width, sharply constricted behind eyes, rapidly broadening to basal fifth, narrowing slightly to base, free of sculpture excepting three or four faint, anastomosing striae at base; cheeks evenly rounded, perfectly smooth excepting at base; vertex slightly elevated and produced, nearly overhanging, bearing the anterior ocellus at its extremity; postocular bristles half as long as head, slender and sharply pointed, yellowish; postocellar bristles remarkably long for the genus, surpassing anterior ocellus, pointed; occi-

put with a pair of smaller bristles midway between eyes and base of head, not so widely separated as postoculars. Eyes little more than 0.2 as long as head, strongly bulging, three-fourths as wide as long, and slightly more than half as wide as their interval, coarsely facetted, not more than four or five facets making up their lateral outline. Ocelli located far forward, anterior one directed forward; center of posterior ones opposite anterior margin of eyes. Antennae about twice as long as head; segments 3-7 pedicellate; 8 broadly united at base to 7. Mouth cone short, semicircularly rounded at apex, reaching about half way across prosternum, tip of labrum not surpassing that of labium.

Prothorax 0.8 as long as head and (inclusive of coxae) 1.75 times as wide as long, surface without sculpture; anterior marginal bristles exceedingly minute, all others long, slender, nearly pointed, yellow in color, those at posterior angles nearly as long as postoculars, those at anterior angles shortest. Pterothorax distinctly wider than prothorax, narrowed posteriorly, sides slightly convex. Wings of nearly the same width throughout, quite uniform brownish, with scale and tip darkest; no accessory hairs on posterior margin; the three subbasal bristles pointed, yellowish, the basal one shortest. Legs quite short and strong; fore tarsi with a slightly curved, sharp tooth which is more than half as long as width of tarsus.

Abdomen only slightly wider than pterothorax. Tube about two-thirds as long as head and 1.8 times as long as basal width, which is twice the apical; sides straight. Bristles long, slender, pointed, yellow, upper pair on segment 9 surpassing tube; terminal bristles brown, much shorter than tube.

Measurements of holotype (♀): Length 1.65 mm.; head, length 0.224 mm., width 0.165 mm., width behind eyes 0.120 mm.; eyes, length 0.048 mm., width 0.036 mm., interval 0.066 mm.; postocular bristles, length 0.111 mm.; prothorax, length 0.180 mm., width (inclusive of coxae) 0.315 mm.; pterothorax, width 0.375 mm.; abdomen, width 0.390 mm.; tube, length 0.149 mm., width at base 0.083 mm., at apex 0.041 mm.

Antennal segment	1	2	3	4	5	6	7	8
Length (μ)	48	57	61	59	61	60	49	39
Width (μ)	45	37	34	37	34	33	29	17

Total length of antenna 0.43 mm.

Described from one female taken by Mr. L. O. Jackson at East Falls Church, Virginia, March 17, 1918, at base of *Andropogon* leaves (No. 356).

A very distinct species, recognizable at once by the dark color, long head, broadly rounded mouth cone, prominent postocellar bristles, and strongly toothed tarsi. The type is abnormal in having three prominent bristles at one of the posterior angles of the prothorax, instead of two.

Adiaphorothrips amplus sp. nov.

Female (macropterous).—Length about 3.3 mm. General color dark blackish brown, with trochanters, knees and tarsi yellowish; antennae with segments 1, 2, 7 and 8 concolorous with body, 2 paler at apex; 3 mostly yellow, shading to brownish apically; 4-6 with a narrow brown ring at extreme base, brownish yellow beyond, then darkened with brown apically, 6 with very little yellow; wings clear.

Head about twice as long as wide, distinctly depressed and prolonged in front of eyes; vertex not produced nor overhanging, sides nearly parallel

but slightly broadest one-third from base and narrowest at posterior margins of eyes; dorsal surface coarsely transversely striate with anastomosing lines which become distinctly reticulate at base of head; ventral surface more deeply and closely striate, particularly at sides behind eyes, and with several very shallow, irregular, transverse furrows in anterior half which give the cheeks, when viewed from above, a subcrenulate outline; postocular bristles pointed, nearly as long as eyes; no prominent bristles in the region of ocelli; cheeks with four or five rather strong bristles. Eyes small, less than one fourth as long as head, much narrower than their interval, projecting beyond outline of head. Ocelli approximate; anterior ocellus distinctly behind anterior margin of eyes and much closer to posterior ocelli than these are to each other. Antennae one and two-thirds times as long as head; intermediate segments elongate, subclavate, 3 about five times as long as wide. Mouth cone short, semicircularly rounded at apex, tip of labrum not attaining that of labium; palpi short.

Prothorax about half as long as head and (inclusive of coxae) twice as wide as long, with distinct median thickening; surface rather faintly sculptured with anastomosing lines along posterior margin, subreticulate at sides anteriorly; bristles reduced in size, excepting the two pairs at posterior angles, which are subequal to postoculars, inner pair longer, pointed. Pterothorax slightly wider than prothorax, sides slightly arched and converging posteriorly, meso– and meta–scuta subreticulate. Legs rather short; fore femora not swollen; fore tarsus with a stout, triangular tooth. Wings of fore pair colorless, expanded apically, closely fringed with colorless hairs, and with 30 or 31 accessory hairs on posterior margin; subbasal bristles small, colorless, blunt or slighty expanded at tips. the basal one shortest, distal one longest.

Abdomen stout and heavy, about 1.5 times as wide as prothorax, rather lightly subreticulate at sides. Tube about three-fourths as long as head, more than three times as long as basal width, which is more than twice the apical, sides straight, smooth, without noticeable bristles. Abdominal bristles long and pointed, brownish; tergites without sigmoid bristles; terminal bristles about half as long as tube.

Measurements of holotype (♀): Length 3.34 mm.; head, length 0.564 mm., width 0.288 mm.; eyes, length 0.125 mm., width 0.080 mm., interval 0.117 mm.; postocular bristles, length 0.113 mm.; prothorax, length 0.273 mm., width 0.555 mm.; pterothorax, width 0.591 mm.; abdomen, width 0.830 mm.; tube, length 0.428 mm., width at base 0.132 mm., at apex 0.057 mm.; terminal bristles, length 0.225 mm.

Antennal segments	1	2	3	4	5	6	7	8
Length (μ)	97	92	231	156	124	102	82	60
Width (μ)	66	48	47	48	42	38	33	20

Total length of antenna 0.94 mm.

Described from one female, taken by Dr. Alex Wetmore, of the U. S. Biological Survey, at Bradentown, Florida, January 20, 1919, by sweeping (No. 527).

This is the first species of the genus to be recorded from North America.

A PRELIMINARY REVISION OF THE CAMPOPLEGINAE IN THE CANADIAN NATIONAL COLLECTION, OTTAWA.*

BY HENRY L. VIERECK,
Ottawa, Ont.

(Continued from page 204)

KEY TO THE SPECIES OF ISCHNOSCOPUS FOERSTER.

1. Abdomen more or less pale, at least not virtually entirely black above, eyes converging below ..... 4.
   Abdomen black ..... 2.
2. Hind coxae black ..... 3.
   Hind coxae reddish, their basitarsi not whitish on basal two-thirds but almost entirely fuscous ..... *alterus* n. sp.
3. Areola angulate at base ..... *mitralis* n. sp.
   Areola truncate at base ..... *truncatellus* n. sp.
4. Hind coxae black ..... *vinalis* n. sp.
   Hind coxae reddish ..... 5.
5. Areolet minute, nearly closed ..... *angustus* n. sp.
   Areolet large ..... 6.
6. Third tergite entirely pale ..... *largo* n. sp.
   Third tergite not entirely pale, fourth tergite black; hind coxae reddish, hind legs not banded with white ..... *paenerivalis* Vier.

KEY TO THE SPECIES OF AMELOCTONUS FOERSTER.

1. Head and thorax mostly black ..... 2.
   Head and thorax mostly reddish ..... *sarntheinii* D.T.
2. Abdomen more or less reddish above ..... 3.
   Abdomen black throughout above ..... 22.
3. Petiole reddish at base ..... 4.
   Petiole black at base ..... 5.
4. Hind tarsi blackish, fuscous ..... *cuneae* n. sp.
   Hind tarsi pale yellow ..... *pallipes* Prov.
5. Hind coxae reddish ..... 8.
   Hind coxae black ..... 6.
6. Not all coxae black ..... 7.
   Hind coxae black, concolorous with the other coxae ..... 14.
7. Areolet petiolate ..... 13.
   Areolet small pentangular or nearly sessile or subsessile ..... 16.
8. Areolet petiolate quadrangular, distinct, well developed, nervellus angulated or not so; propodeum finely sculptured, its carinae distinct ..... 11.
   Areolet virtually sessile ..... 10.
10. Tergites beyond the first more or less blackish. (*Hypothereutes*) *vernalis* Vier.
    Tergites beyond the first reddish ..... *congeneris* n. sp.
11. Hind tibiae black and white ..... *eurythemeae* n. sp.
    Hind tibiae reddish ..... 12.
12. Second tergite entirely reddish ..... *perrivalis* Vier.
    Basal two-thirds of second tergite black ..... *clisiocampae* Weed
13. Basal area triangular ..... *certus* n. sp.
    Basal area nearly quadrate ..... *speciosus* n. sp.

14. End of abdomen reddish ..... *nematicidus* n. sp.
End of abdomen black ..... 15.
15. Hind tibiae not partly whitish ..... *asper* n. sp.
Hind tibiae on the extensor surface mostly whitish ..... *degrysei* n. sp.
16. Tergites two and three with apical yellowish or reddish margins ..... 17.
Tergites two and three or at least three mostly or entirely unicolorous .... 20.
17. All tergites with yellowish or reddish apical margins ..... 18.
Tergites two and three with reddish apical margins ..... 19.
18. Basal area not longitudinally oblong ..... *intimus* n. sp.
Basal area longitudinally oblong ..... *oblongus* n. sp.
19. Fore and mid coxae not white, the fore coxae reddish-brown and infuscated, mid and hind coxae dark brownish almost black, hind femora reddish; first tergite, second except an apical band, third, fourth and fifth with a large spot on basal two-thirds, all black ..... *galvestonensis* Vier.
Fore and mid coxae white ..... *brevicauda* Prov.
20. Tergite three mostly black ..... *nigridorsis* n. sp.
Tergite three mostly stramineous ..... 21.
21. Apical half of postpetiole mostly black ..... *diversus* n. sp.
Apical half of postpetiole mostly pale ..... *disippi* n. sp.
22. Hind coxae black ..... 23.
Hind coxae reddish or stramineous ..... 30.
23. Hind tibiae without whitish annuli ..... 25.
Hind tibiae and metatarsi with whitish annuli ..... 24.
24. Hind tibiae black at tip and base ..... *fugitivus* Say.
Hind tibiae black at tip and near the base ..... 26.
25. Areolet sessile or nearly sessile ..... 29.
Areolet petiolate ..... 28.
26. Fore and mid coxae pale ..... *annulipes* Cress.
Fore and mid coxae or at least mid coxae mostly black ..... 27.
27. Hind tibiae not white in the middle ..... *pauxillus* n. sp.
Hind tibiae white in the middle ..... *confusus* n. sp.
28. First, second and third joints of hind tarsi mostly whitish *delicatus* n. sp.
First, second and third joints of hind tarsi mostly blackish *fuscitarsus* n. sp.
29. Areolet subsessile, hind tarsi dark stramineous ..... *banffensis* n. sp.
Areolet sessile, hind tarsi fucous ..... *popofensis* Ashm
30. Hind tibiae with a whitish annulus at base; basal area triangular ..... *guignardi* Prov.
Hind tibiae without a whitish annulus at base ..... 31.
31. Antennae black, lateral longitudinal carinae wanting or barely indicated ..... *taeniopus* new name (*Hypothereutes annulipes* Ashm. preoc.).
Antennae mostly yellowish ..... *xanthocerus* Vier.

KEY TO THE SPECIES OF BATHYPLECTES FOERSTER.

1. Abdomen black or blackish throughout ..... *lucta* Davis
Abdomen not unicolorous ..... 2.
2. Second tergite without an apical yellowish band but with a reddish margin hind legs a little varied with white ..... *curculionis* Thomson
Second tergite with an apical yellowish or stramineous band ..... 3.

3. Hind tibiae black and whitish ..... *phytonomi* n. sp.
Hind tibiae not black and whitish ..... 4.
4. Hind tibiae reddish stramineous ..... *bryanti* n. sp.
Hind tibiae yellowish and fuscous ..... *etemankiakorum* Viereck.

KEY TO THE SPECIES OF CAMPOPLEX GRAV.

1. Greatest diameter of lateral ocelli distinctly less than ocellocular line .... 8.
Greatest diameter of lateral ocelli equal to or longer than ocellocular line; propodeum more or less channeled ..... 2.
2. Head quadrate, with outside line of eyes and temples nearly in the same plane 3
Head not quadrate, outside line of temples not nearly attaining plane of outside line of eyes ..... 15.
3. Scape black beneath ..... 4.
Scape pale brown beneath; hind femora stramineous ..... *nigricincta* Ashm.
4. Hind femora blackish ..... 5.
Hind femora reddish, all coxae black, sometimes fore and mid-coxae pale at apex, wings hyaline ..... 6.
5. Ovipositor one fourth as long as the abdomen ..... *banksi* Vier.
Ovipositor three fifths as long as the abdomen ..... *epinotae* Vier.
6. Propodeum sulcate, abdomen entirely black ..... 7.
Propodeum not sulcate, abdomen not entirely black ..... *tecumseh* n. sp.
7. Hind tibiae black and white ..... *relativus* Vier.
Hind tibiae not black and white ..... *sulcatellus* n. sp.
8. Propodeum channeled ..... 9.
Propodeum not channeled ..... 10.
9. Areolet sessile, large, wings subhyaline, head and thorax black; tergites of abdomen entirely black; all coxae black at least basally, hind tibiae black except at base ..... *fura* Cress.
Areolet petiolate ..... *moderatus* n. sp.
10. Abdomen entirely black above ..... *maquinnae* Vier.
Abdomen not entirely black above ..... 11.
11. First tergite reddish apically ..... 13.
First tergite black apically ..... 12.
12. Fourth tergite reddish stramineous throughout, the third blackish throughout; fore and mid-coxae largely yellowish ..... *paenexareolata* Vier.
Fourth tergite stramineous on basal third, apical third of second tergite stramineous, third tergite almost entirely dark, rather blackish ..... *pentagoetorum* Vier.
13. Apical half of second, most of third, and base of fourth reddish ..... *polychrosidis* Vier.
Apical fourth of second reddish ..... 14.
14. More than apical half of third tergite reddish ..... *hullensis* n. sp.
Most of apical half of third and all of fourth tergites reddish; more or less of sides and apical third of succeeding tergites more or less distinctly reddish ..... *vigilis* Vier.
15. All coxae reddish or pale, at least beneath ..... 18.
Not all coxae reddish ..... 16.

16. Abdomen entirely black above; hind coxae black ..... 27.
Abdomen not entirely black above ..... 17.
17. Abdomen partly brownish above, mostly black .....*signatus* n. sp.
Abdomen mostly reddish above; hind coxae reddish ..... 22.
18. Propodeum not channeled ..... 20.
Propodeum channeled ..... 19.
19. Abdomen mostly black ..... 21.
Abdomen mostly yellowish-red ..... *ferruginosus* Vier.
20. Abdomen mostly black ..... 26.
Abdomen mostly reddish ..... *arcanus* n. sp.
21. Hind tibiae partly white ..... *militaris* n. sp.
Hind tibiae not partly white ..... *deceptivus* n. sp.
22. Abdomen mostly reddish above, ovipositor distinctly exserted .....
.....*grossulariflorae* Vier.
Abdomen not mostly reddish above ..... 23.
23. Hind coxae black ..... 24.
Hind coxae reddish . *ruficoxalis* n. sp. *C.* (*Angitia*) *ruficoxa* Vier. not Prov.
24. Areola pointed at base ..... *algonquinorum* n. sp.
Areola truncate at base ..... 25.
25. Hind tibiae partly whitish ..... *grimsbyensis* n. sp.
Hind tibiae reddish ..... *erythromera* n. sp.
26. Ovpositor longer than the abdomen ..... *macrurus* n. sp.
Ovipositor not as long as the abdomen ..... *ultimus* n. sp.
27. Hind tibiae white banded or striped, scape black; ovipositor distinctly exserted ..... 28.
Hind tibiae not white banded or striped, hind trochanters reddish or blackish
..... 31.
28. All coxae black, areolet petiolate ..... *phthorimaeae* Cush.
Hind coxae only black ..... 29.
29. Areolet sessile or nearly so, nervellus angulated or not angulated; median longitudinal carinae not confluent with the costulae ..... *augustus* Vier.
Areolet petiolate ..... 30.
30. Median longitudinal carinae confluent with the costulae .... *juxtus* n. sp.
Median longitudinal carinae not confluent with the costulae ..*militaris* n. sp.
31. Hind trochanters reddish ..... 34.
Hind trochanters black or blackish ..... 32.
32. Areola virtually pointed at base ..... 33.
Areola broadly truncate at base ..... *aylmerensis* n. sp.
33. Fore and mid coxae mostly pale ..... *angularis* n. sp.
Fore and mid coxae mostly black ..... *cavus* n. sp.
34. Fore and mid coxae black at least basally .....*nolae* Ashm.
Fore and mid coxae stramineous ..... *ontario* n. sp.

KEY TO THE SPECIES OF DIADEGMA FOERSTER.

1. Hind legs not banded with white nor pale color, head and thorax black ....6.
Hind tibiae pale in the middle ..... 2.
2. Areolet petiolate ..... 4.
Areolet sessile ..... 3.

3. Mid and hind femora black ..... *sessile* Prov.
Mid and hind femora reddish ..... *ruficruris* n. sp.
4. Abdomen partly reddish or pale above ..... 5.
Abdomen black above ..... *costata* n. sp.
5. Hind tibiae reddish ..... *partis* n. sp.
Hind tibiae blackish ..... *curticauda* n. sp.
6. Abdomen not entirely black nor entirely reddish ..... 7.
Abdomen black ..... 8.
7. Mid and hind coxae black, the mid pair sometimes pale at apex ..... 9.
Hind coxae only black, apex of second and third abdominal segments and oblique blotches on sides of fourth and fifth segments reddish; fore and mid legs white ..... *solenobiae* Ashm.
8. Propodeum excavated ..... *hyalina* Prov.
Propodeum not excavated ..... *planata* n. sp.
9. Female, apex of third and sides as well as the sides of the following segments reddish ..... *eurycreontis* Ashm.
Male, a small spot on the second and the sides of the following segments reddish, areolet triangular, petiolate ..... *pattoni* Ashm.

KEY TO THE SPECIES OF DIOCTES FOERSTER.

1. Scape black ..... 2.
Scape more or less pale; fore and mid coxae pale ..... 4.
2. Hind femora reddish ..... 3.
Hind femora black ..... *modestus* Brues.
3. Mandibles yellow except at apex ..... *rosaceanae* n. sp.
Mandibles tipped with yellow ..... *montanus* Ashm.
4. Hind femora not black ..... 5.
Hind femora black ..... *maculipes* Cam.
5. Hind femora not blackish at base ..... 6.
Hind femora blackish at base beneath ..... *eureka* Ashm.
6. Propodeal carinae, except basal, indistinct ..... *alticola* Cush.
Propodeal carinae distinct ..... *obliteratus* Cress.

KEY TO THE SPECIES OF ANGITIA FOER.

1. Abdomen not black throughout above ..... 14.
Abdomen black throughout above ..... 2.
2. Scape mostly dark brown to blackish beneath ..... 6.
Scape mostly pale beneath; costulae more or less developed ..... 3.
3. Basalarea not the only complete area ..... 4.
Basalarea only complete ..... *milleri* Roh.
4. Areola not confluent with the petiolarea ..... *tineavora* Roh.
Areola confluent with the petiolarea ..... 5.
5. Basal area broad at apex ..... *galleriae* Cush.
Basalarea acute at apex ..... *affinis* Cress.
6. Costulae virtually wanting ..... 7.
Costulae more or less distinct and complete ..... 11.
7. Hind tibiae blackish or brownish with a whitish annulus ..... 8.
Hind tibiae without a white annulus ..... 9.
8. Venation typical ..... *pterophorae* Ashm.

Venation as in *Ameloctonus* ..... *rosanae* Vier.
9. Hind tibiae pale brown except for the apical half which is more or less blackish above and extreme base which is yellowish above *aestivalis* Vier.
Hind tibiae rather uniformly stramineous ..... 10.
10. Areolet minute or small ..... *macer* Cress.
Areolet large ..... *cacoeciae* Vier.
11. Hind coxae black, hind tibiae with a broad whitish annulus 12
Hind coxae reddish, hind tibiae without a broad whitish annulus; scape with a yellowish tip; second abscissa of discoidal vein distinctly shorter than the third ..... *openangorum* Vier
12. Scape dark brownish with pale tip; propodeum rather coarsely sculptured ..... *parviformis* Vier.
Scape black throughout; propodeum finely sculptured ..... 13.
13. Second abscissa of discoidal vein distinctly longer than the third *plutellae* Vier.
Second abscissa of discoidal vein apparently shorter than the third ..... *basizona* Vier.
14. Hind coxae mostly reddish ..... 15.
Hind coxae mostly black or blackish ..... 16.
15. Scape mostly dark, brownish; hind tibiae without a broad whitish band; eyes at least in the female not converging below; spiracle of first tergite protuberant, thyridia black ..... *oedemisiformis* Vier.
Scape mostly yellowish; hind tibiae with a broad whitish band; eyes at least in female converging below ..... *rivalis* Cress.
16. Eyes converging below ..... 17.
Eyes not converging below ..... 18.
17. Scape pale beneath ..... *obscura* Cress.
Scape blackish beneath ..... *hellulae* Vier.
18. Abdomen mostly black ..... 19.
Abdomen mostly reddish ..... *cuurae* Ashm.
19. Scape yellowish beneath, areola and petiolarea confluent .... *kichtani* Vier.
Scape blackish throughout; areola and petiolarea not confluent *woonandi* Vier.

(To Be Continued)

NOTES ON COCCIDAE XI. (HEMIPTERA).[1]

BY G. F. FERRIS,
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SOME APPARENTLY UNDESCRIBED SPECIES.

The types of the following new species are deposited in the Stanford University collection.

Genus **Marchalina** Vayssiere.

This genus, with *Paleococcus hellenicus* Gennadius as type, has recently been erected. I have at hand an undescribed species which is apparently congeneric with the type. Upon the basis of the two I would characterize the genus as follows.

Monophleboid Coccidae with the mouthparts in the adult female much reduced, vestiges of the internal framework alone remaining, the labium entirely

1.—Continued from Canadian Entomologist, Vol. LV., page 248.

absent; without a marsupium and without a ventral abdominal pore ring for the secretion of an ovisac; entirely without ventral areolae; with the anal tube at the most but weakly chitinized and not bearing pores; antennae and legs strongly developed, the former 10-11 segmented, the latter without knobbed setae on the tarsi and with but two simple digitules on the claw; derm thickly beset with small, acute spines or with spines and setae; seven pairs of abdominal spiracles present, these without pores. Intermediate stages not known. First stage with six-segmented antennae, the last segment somewhat swollen; the posterior end of the body not beset with long setae.

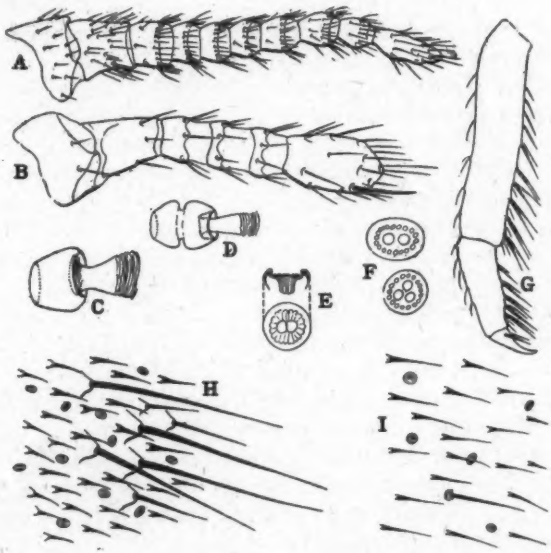

Fig. 1.—*Marchalina hellenica* (Gennadius): *A.*—antenna of adult female; *B.*—antenna of first stage; *C.*—abdominal spiracle; *F.*—types of pores; *G.*—tibia and tarsus; *I.*—portion of derm, showing vestiture of spines and setae. *Marchalina azteca* n. sp.: *D.*—abdominal spiracle; *E.*—type of pore; *H.*—portion of derm, showing vestiture of spines and setae.

Marchalina hellenica (Gennadius).

Fig. 1A, B, C, F, G, I.

Material examined. Adult females and first stage nymphs from *Pinus halepensis,* Greece, received through the kindness of Mr. P. Vayssiere.

Notes. I am presenting figures and notes upon this species in order to make clearer the specific characters in the genus. The adult female is 7-8 mm long on the slide, the general form elongate oval or slightly pyriform. Derm membranous throughout. Antennae (Fig. 1A) slender, 10-11 segmented. Legs moderately stout, the tarsus (Fig. 1G) slightly less than half as long as the tibia, the claw with but two slender digitules. Derm (Fig. 1I) thickly and uniformly beset with small spines, mingled with which are a few slender setae and many pores of the type shown in Fig. 1F. Anal orifice not surrounded by setae. Anal tube weakly, but definitely, chitinized. Abdominal spiracles (Fig. 1C) moderately large, simple, without pores.

First stage with the antennae (Fig. 1B) rather stout, the terminal segment somewhat swollen. Body beset with small spines and setae, the posterior extremity with but a few short setae.

Marchalina azteca n. sp.

Fig. 1D, E, H.

Type host and locality. From *Pinus teocote,* Mexico City, Mexico. Received through the kindness of Professor Ruelas of the Direccion de Estudios Biologicos of Mexico.

Habit. No information is available as to the occurrence of the insects on their host. In life the adult female is of a reddish color. At maturity a fluffy mass of secretion entirely conceals the insect and within this the orange colored eggs are deposited.

Morphological characters. Length (on slide) 5-7 mm. General form elongate oval or slightly pyriform. Antennae and legs heavily chitinized, almost black, of the same character as in *M. hellenica.* Derm thickly beset with small, acute spines mingled with an occasional seta and along the lateral margins with segmentally disposed clusters of from 2 to perhaps 15 conspicuous setae of various lengths (Fig. 1H) and with numerous such setae on the ventral side between the bases of the antennae. Mingled with the setae and spines are numerous pores of the type shown in Fig. 1E. Abdominal spiracles (Fig. 1D) quite small and inconspicuous, of the same general type as in *hellenica.* Anal tube very weakly chitinized; anal orifice surrounded by many small setae.

First stage apparently identical with that of *hellenica.*

Notes. While I have not the slightest doubt that this species is strictly congeneric with *M. hellenica* the two species are very distinct, *M. azteca* being especially marked by the clusters of conspicuous setae along the margins of the body and by the numerous large setae between the bases of the antennae.

Pseudococcus adenostomae n. sp.

Fig. 2.

Type host and locality. From *Adenostoma fasciculatum,* near San Diego California, Aug. 1920. Specimens received from Mr. G. R. Gorton.

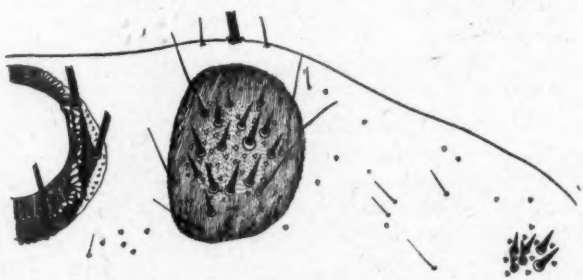

Fig. 2.—*Pseudococcus adenostomae* n. sp.; anal lobe and penultimate cerarii and portion of anal ring.

Habit. No information is available as to the appearance of the insect in life, but judging from its structure there will be rather conspicuous caudal filaments of wax with the lateral filaments entirely lacking. There is probably no ovisac.

Morphological characters. Length on slide 3.5 mm. General form broadly oval. But three cephalic and three or four caudal pairs of cerarii are present. Anal lobe cerarii consisting of a large, oval and slightly convex chitinized area which bears as many as a dozen conical setae and several slender setae together with a few scattered pores. Penultimate and ante-penultimate cerarii with four to six conical setae and a few pores. Fourth cerarii, if present, containing but two conical setae. Cephalic cerarii with from four to six conical setae and a few pores. Ventral side of the anal lobes without chitinization. Anal ring large, close to the posterior margin, only slightly cellular. Anal ring and anal lobe setae quite long, sub-equal.

Derm rather sparsely beset with trilocular pores and with very few, small, tubular ducts, entirely without the circular, multilocular pores which are associated with the formation of an ovisac. Dorsal setae very few, small, slender. Ventral setae more numerous and of variable lengths but not conspicuous.

Antennae eight-segmented, rather short but not stout. Legs noticeably short, the combined tibia and tarsus scarcely exceeding the stout femur in length.

Notes. This species is very close to *Pseudococcus crawii* (Coq.), differing from the latter in the absence of the lateral cerarii. It is conceivable that it is merely a variant of *crawii*.

Phenacoccus serratus n. sp.

Fig. 3.

Type host and locality. From *Fagus americana,* Port Colborne, Ontario, Canada, Sept. 1917 (R. W. Doane). Also from the same host at Cranberry Lake, New York, Sept. 1917 (C. J. Drake) and at Columbus, Ohio, Oct. 1919 (P. R. Lowry).

Habit. No notes are available as to the appearance of the species in life. Judging from its morphology it will have short waxy tassels and at maturity will probably be entirely concealed in its ovisac.

Morphological characters. Length on slide 3 mm. Of ordinary oval form. The most distinctive character of the species is to be found in the departure from the normal number of 18 pairs of cerarii and the elevation of the cerarii upon pronounced prominences. The number of cerarii is difficult to determine definitely because of the presence of minor setiferous elevations but there are apparently about 26. The prominences in the cephalic region (Fig. 3A) bear as many as 4 or 5 conical setae while those in the abdominal region have but two and in all cases there is no noticeable concentration of pores. In well stained specimens the prominences appear as slightly chitinized.

Ventral side of the prominent anal lobes (Fig. 3B) at the most but faintly chitinized; bearing one long and two or three shorter setae which are well removed from the apex. Anal ring with very small pores, the anal ring setae about equal to the major anal lobe seta.

Derm with numerous trilocular pores and also with large numbers of the large, circular, multilocular pores (Fig. 3C) which are ordinarily associated with the production of the ovisac. These multilocular pores are abundant both dorsally and ventrally especially in the abdominal region but some are to be found even on the head. Dorsal setae few, small, conical, frequently elevated upon small prominences, sometimes in conjunction with one or two trilocular pores.

Ventral setae numerous and conspicuous, especially so between the bases of the antennae, of various lengths.

Antennae long and slender, 9-segmented. Legs noticeably long and slender, the claw with the usual tooth.

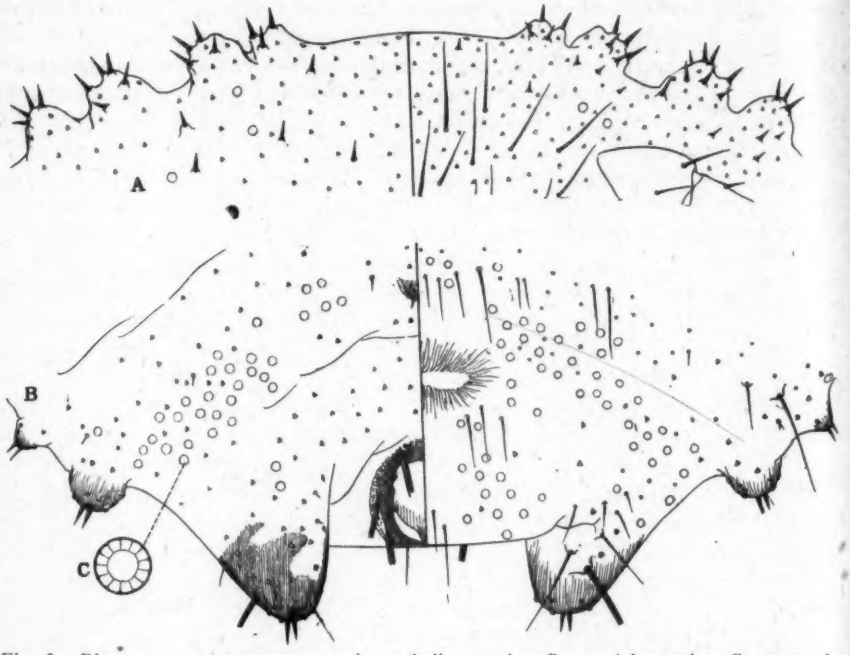

Fig. 3.—*Phenacoccus serratus* n. sp.: *A.*—cephalic margin; *B.*—caudal margin; C.—type of multilocular pore.

Notes. This species differs very markedly from any other American form in the number and development of the cerarian prominences. These remain apparently even in fully mature specimens. In some other forms such prominences appear in immature individuals but appear to be suppressed at maturity by the stretching of the derm.

Lecanium coryli (Linn.).

Fig. 4.

Through the kindness of Mr. R. Glendenning of the Entomological Laboratory at Agassiz, British Columbia I have been enabled to examine material of a *Lecanium* taken from maple at Vancouver. I am informed by Dr. J. McDunnough that this has been identified by Mr. F. Laing of the British Museum as *Lecanium capreae* (Linn.).

European authors (Marchal, Leonardi, Silvestri) have adopted the view that *L. capreae* is a synonym of *L. coryli* (Linn.). Although an extended account of the species is given in the appendix of Leonardi's monograph of the Coccidae of Italy I am presenting here figures and some notes concerning it. The species has been recorded from Nova Scotia but is by no means well known to American students of the Coccidae.

The species is rather large but otherwise presents no specially distinctive macroscopic characters. Microscopically, however, it is very well marked. The most distinctive feature is the nature of the marginal setae. Of these there is a rather definite single row, those around the cephalic margin being very long and slender as are also those on the anal lobes. Along the lateral margins these slender setae give way to much shorter and moderately stout setae which are rather widely spaced. The stigmatic depressions are very shallow, connected to the corresponding spiracle by a single row of pores of the type shown in Fig. 4D and the stigmatic setae (Fig. 4E) are short, being scarcely longer than the shorter marginal setae and variously shaped. Some are clavate, other spatulate, others rounded at the apex.

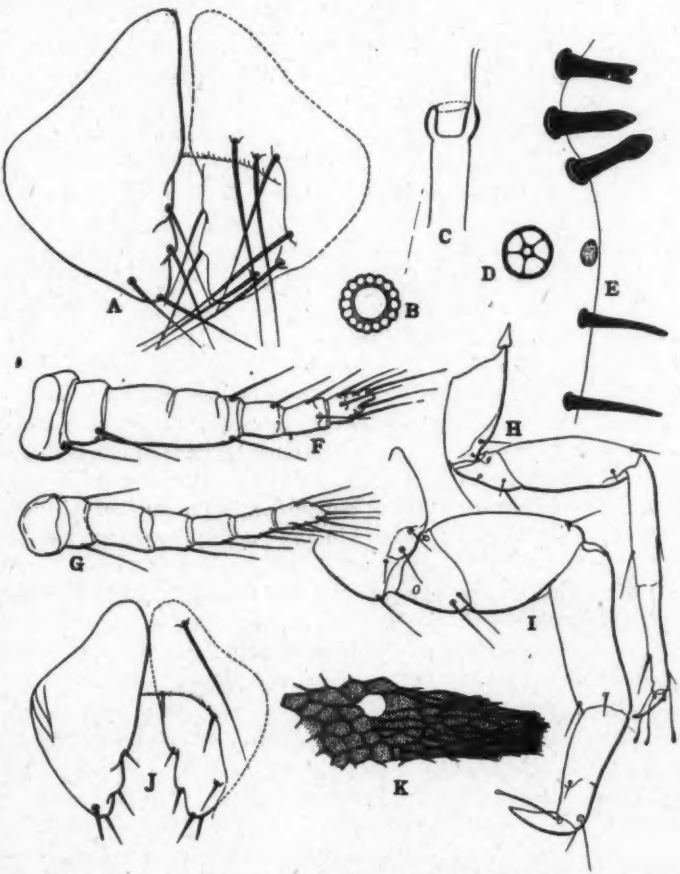

Fig. 4.—*Lecanium coryli* (Linn.): *A.*—anal plates of adult; *B.*—type of ventral pore; *C.*—tubular duct; *D.*—pore of stigmatic furrow; *E.*—stigmatic and marginal setae; *F.*—antenna of adult; *G.*—antenna of second stage; *H.*—leg of second stage; *I.*—leg of adult; *J.*—anal plates of second stage; *K.*—tessellated portion of derm about anal plates in adult.

The median region of the venter of the abdomen bears great numbers of multilocular pores of the type shown in Fig. 4B and there is a narrow, ventral,

marginal zone of tubular ducts of the type shown in Fig. 4C. These tubular ducts differ from those of many other species in this genus in the breadth and depth of the cup.

The anal plates (Fig. 4A) are quite large, the setae arranged as shown. About them there forms in early maturity a chitinized area with marked reticulations as shown in Fig. 4K. In fully mature individuals the derm, while quite heavily chitinized, shows few markings other than in this area.

The antennae are rathed short, 6-7 segmented. The legs are noticeably stout, with an exceptionally stout claw.

The second stage is structurally much like the adult, with similar marginal setae. The legs, however, are much more slender and the anal plates are quite small and bear only short setae as shown in Fig. 4J.

BRITISH CORRELATING COMMITTEE FOR THE PROTECTION OF *NATURE*

The British Correlating Committee for the Protection of Nature, which is composed of representatives of the Societies in Great Britain (among them being the Entomological Society of London) interested in the protection of animal and plant life, has learnt with grave concern of the serious effect on the numbers of certain beautiful species of butterflies in the British Isles resulting from the use of the wings of these insects for jewellery and similar purposes.

Some of the most active dealers in these insects are in Canada and the United States. Accordingly the British Correlating Committee and the Entomological Society of London appeal to Entomological and Natural History Societies in Canada and the United States to use their utmost influence to prevent the threatened extermination of the coveted species. Inasmuch as legislation would be difficult both to secure and to enforce, use must be made of moral suasion. The dealers themselves would no doubt be fully alive to the disadvantage from the commercial point of view of a serious diminution in the number of these butterflies, and would be willing to cooperate in any reasonable measures to secure the end in view.

For the British Correlating Committee for the Protection of Nature. Rothschild, Chairman. G. F. Herbert Smith, Hon. Sec.-Treas.

For the Entomological Society of London. E. B. Poulton, President. S. A. Neave, Hon. Sec.

Mailed September 26, 1925.